Investing in Next Generation Deployable HVAC Technologies with Navy and ARPA-E
By John Jennings | January 23, 2013

Today ASD Burke joined her colleagues, Tom Hicks, Deputy Assistant Secretary of the Navy for Energy, and Cheryl Martin, Deputy Director of the Department of Energy's Advanced Research Project Agency – Energy to announce a new effort to improve the efficiency of heating and air conditioning systems on the battlefield. Specifically, they announced that five small businesses and labs have been selected as performers for $8.5M in awards for innovative new combat air conditioning technologies.

The Department is doing this because as we've seen in the wars in Iraq and Afghanistan, thousands of troops have been killed or injured moving fuel that powers our equipment, including heating and cooling systems, when our adversaries target supply convoys on the battlefield. In fact, a 2010 Marine Corps assessment estimated that nearly 25% of fuel used in Afghanistan goes to heating and cooling structures. A separate Navy assessment found that heating and air conditioning systems were among the top five consumers of fuel for Navy expeditionary forces.

By harnessing energy efficient and new energy technologies, we can help our troops spend less time moving and protecting fuel, and give them more time to focus on their missions. In short, better energy options help make our forces more flexible and agile in combat.

One way we are doing this is through the Operational Energy Capabilities Improvement Fund, or OECIF, which DoD established last January and which OEPP manages. The awards announced today are part of a Navy and Advanced Research Projects-Energy (ARPA-E) program funded by OECIF to invest in next generation deployable HVAC technologies.

We're planning to do this by taking advantage of recent advances in the commercial marketplace in heating and cooling technologies, particularly with thermal energy based air conditioners, solid state cooling, membrane based dehumidification, and water based vapor compression. By adapting these types of technologies to the rigors and constraints of the expeditionary environment, our team of scientists and engineers seek to reduce fuel consumption for heating and cooling by 20–50%. These are dramatic advances and have the potential to significantly reduce fuel usage for battlefield heating and cooling.

For this project, DoD is leveraging ARPA-E's Building Energy Efficiency Through Innovative Thermodevices (BEET-IT) program, which is developing new approaches and technologies for building cooling equipment here at home. ARPA-E's model is to advance high-potential, high-impact energy technologies that are too early for private-sector investment. They focus on transformational energy projects that have the potential to radically improve U.S. economic prosperity, national security, and environmental well-being with a small investment over a defined period of time.

And in that way, this project is no different. In addition to the potential for reducing fuel use on the battlefield, in the U.S., residential and commercial buildings account for 72% of the nation's energy use. As the demand for air conditioning in homes and work spaces increases, we need new and more efficient cooling methods to reduce building energy consumption and environmental impact. Advances from the awards being announced today have the potential to do just that!

The award recipients are:

ADMA – Hudson, Ohio ($876,342)
ADMA is developing an energy-efficient, compact dehumidification system. The system contains foil-

like membranes that allow water vapor to be efficiently removed from humid air, and cools air using an estimated 20-50% less fuel. The cooling system enables high-volume, low-cost mass production.

Dais – Odessa, Florida ($800,000)
Dais is developing an energy-efficient, compact dehumidification system utilizing a polymer membrane that allows moisture - but not air - to pass through it. This membrane allows for water vapor to be efficiently removed from humid air, and enables high-volume, low-cost mass production of the dehumidification system that could decrease the amount of fuel needed at forward operating bases by 20-50%.

Georgia Tech – Atlanta, Georgia ($2,315,846)
Georgia Tech is developing a new type of absorption heat pump – a one-unit air conditioner and heater - that can be integrated with a high energy efficiency, mass produced, and smaller diesel generator. Georgia Tech's innovative pump could halve the amount of energy used for heating and cooling at forward operation bases by 50% by utilizing the exhaust heat to provide heating and cooling.

Pacific Northwest National Laboratory – Richland, Washington ($2,790,343)
PNNL is developing an adsorption air conditioner which can be integrated with a diesel generator, allowing for more energy-efficient, less costly, and much more compact adsorption air conditioners that could halve the amount of fuel used for cooling at forward operation bases by utilizing waste heat from a diesel generator to provide cooling.

Infinia Technology Corporation – Kennewick, Washington ($1,767,469)
Infinia is developing an energy-efficient, compact, heat pump – a one-unit air conditioner and a heater - that uses an unconventional, high-efficiency, Stirling cycle system to produce cooling and heating more efficiently. Infinia's improvements to Stirling cycle systems will enable the cost-effective mass production of compact, high-efficiency air conditioners that could reduce the amount of fuel used at forward operating bases by 20-50% for cooling and over 60% for heating.

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